

## Child undernutrition: opportunities beyond the first 1000 days

Stunting—an indicator of linear growth retardation that results in low height-for-age—reflects poor growth and development in children, which is a major public health concern in developing countries.<sup>1</sup>

Stunting often begins in utero and increases, on average, for at least the first 2 years after birth. The first 1000 days between conception and a child's second birthday has been identified as the most crucial window of opportunity for interventions.<sup>1</sup> Evidence suggests that stunting is largely irreversible after the first 1000 days, leading to an intergenerational cycle of poor growth and development, in which women who were stunted in childhood remain stunted as adults and tend to have stunted offspring.<sup>1</sup> However, evidence indicates that accelerated linear growth in childhood and adolescence following stunting in infancy (ie, catch-up growth) can occur.<sup>2–4</sup> Evidence from the Young Lives international cohort study<sup>2</sup> in Ethiopia, India, Peru, and Vietnam, found that around 50% of children who were stunted at age 1 year showed improvements in height and were no longer stunted at age 8 years in the absence of an intervention. Other longitudinal observational studies<sup>4</sup> have also reported catch-up growth in childhood.

Could adolescence represent a crucial window for interventions after the first 1000 days? In particular, interventions that improve the nutritional status of adolescent girls, a group that is especially susceptible to the effects of undernutrition, could potentially break the intergenerational cycle of poor growth and development in low-income and middle-income countries.<sup>1,5</sup> However, the mechanism by which intergenerational benefits might be realised through interventions at this age is unclear. Moreover,

whether these benefits might result from interventions that promote catch-up growth in adolescent girls remains unknown. This uncertainty exists despite the argument that adolescence—a period characterised by rapid growth that is second only to that of infancy—presents an opportunity for catch-up growth<sup>5,6</sup> and greater adult height,<sup>4</sup> and that improved adult height in mothers is expected to lead to better outcomes in offspring.<sup>4</sup>

Evidence<sup>4,5,7</sup> has provided support for these hypotheses. For example, analysis<sup>8</sup> of Young Lives data shows that among 12-year-old girls with height below the WHO standard for their age group, on average, 40% of the height deficit was recovered by age 19 years. Furthermore, children with mothers who were stunted as adults were about 15% more likely to be stunted as infants and to remain stunted through early adolescence than children with mothers who were not stunted as adults.<sup>8</sup>

Another important question for policy is whether improvements in nutrition beyond the first 1000 days do not only remedy growth, but also deficits in cognitive development that are associated with early undernutrition. Some evidence from observational studies<sup>3,4,7</sup> supports an association between accelerated growth in childhood and adolescence and cognitive achievement. Indeed, among children who were stunted at age 1 year, those who were not stunted at age 8 years performed better in achievement tests compared with children who were stunted at both ages.<sup>3</sup> However, a few studies have assessed the effect of recovery from stunting on cognitive achievement in children aged between 5 and 8 years and evidence from existing studies<sup>3,8</sup> has been mixed. A meta-analysis<sup>9</sup> showed that nutrition interventions had a positive effect after age 2 years, but this effect was considerably smaller than the effect of interventions before age 2 years. More research is needed to

establish a causal link between catch-up growth after the first 1000 days and cognitive development.

Although the first 1000 days is a crucial stage for future growth and development and the most important period for interventions against stunting, accelerated linear growth can occur at later ages and might reverse stunting, particularly during adolescence, and this might present another opportunity for interventions aiming to break the intergenerational cycle of child undernutrition.

We declare no competing interests.

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